

Service Instructions

SONOREX

Compact Ultrasonic Cleaning Units

Type:

230 V	115 V
RK 31, RK 31 H	RK 31, RK 31 H
RK 52, RK 52 H, RK 52 CH	RK 52, RK 52 H, RK 52 CH
RK 100, RK 100 H, RK 100 SH, RK 102 H, RK 102 CH	RK 100, RK 100 H, RK 100 SH, RK 102 H, RK 102 CH
TK 100, TK 100 H	TK 100 H
RK 103 H, RK 103 CH	RK 103 H, RK 103 CH
RK 106	RK 106
RK 156, RK 156 BH	RK 156, RK 156 BH
RK 158 S	
RK 170, RK 170 H	
RK 255, RK 255 H, RK 255 CH	RK 255, RK 255 H, RK 255 CH
RK 510, RK 510 H	RK 510, RK 510 H
RK 512 H, RK 512 CH	RK 512 H, RK 512 CH
RK 513	RK 513
RK 514, RK 514 H, RK 514 BH	RK 514 H, RK 514 BH
RK 515 CH	RK 515 CH
RK 517 H	
RK 1028, RK 1028 H, RK 1028 BH, RK 1028 C, RK 1028 CH	RK 1028, RK 1028 H, RK 1028 BH, RK 1028 C, RK 1028 CH
RK 1029, RK 1029 H	
RK 1040	RK 1040
RK 1050, RK 1050 H, RK 1050 BH, RK 1050 CH	RK 1050, RK 1050 CH

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Enclosures:

- 1 Circuit diagram
- 2 Layout
- 3 Wiring diagram(s)
- 4 Setting, adjustment instructions or service-test specification

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1 General notes

BANDELIN Compact Ultrasonic Cleaning Units for aqueous cleaning liquids **are efficient and failsafe.**

The performance of the units depends on a number of factors, e.g

- the cleaning liquid used,
- the filling-level in the oscillating tank or in the inserted beaker,
- the quantity of goods to be cleaned,
- the temperature of the cleaning or contact liquid.

Ultrasound will heat up the cleaning or contact liquid in the oscillating tank or in the inserted beaker even without additional heating. After a 30 minutes exposure to ultrasonic waves, the temperature of the cleaning or contact liquid increases from an initial 22 °C to approximately 35 to 45 °C without covering the oscillating tank or the inserted beaker. During constant use, temperatures of more than 80 °C can be reached. If the oscillating tank or the inserted beaker has been covered, the temperature of the cleaning or contact liquid will be increased to about 70 or 80 °C after 60 minutes of constant use.

When switching on the heating in SONOREX units, the tolerances given by the thermostat-switching hysteresis must be taken into consideration. Especially in the case of low heating temperatures deviations of up to 10 °C are possible.

If disturbances should occur after a longer period, the following hints support the user to repair the unit.

2 Fault analysis

Faults	Possible causes	Tests and Remedies
Unit cannot be switched on. → green pilot light is not illuminated.	No power	
	- Plug loose?	Check plug.
	- Defective mains fuse?	Change main fuse.
	- Defective mains cable?	Check cable for conductivity, if necessary exchange it.
	- Defective timer?	Check plug connections 1-3 and 4-6 for conductivity on wound-up timer, repeat measurement on constant setting (*) on plug connections 1-2 and 4-6. Change timer chapter 5.6.
	- Short-circuit on generator PCB?	Change fuse, measure resistance on PCB between phase and phase and between phase and protective earth conductor.
	- Defective generator fuse?	Check generator fuse for conductivity and if necessary exchange.
	- Defective transistors?	Check transistors for conductivity and exchange if necessary, see chapter 5.1.
→ generator fuse blows again after exchange.	- Liquid or foreign particles on PCB?	Carefully clean PCB with compressed air or return unit for repair to the supplier.

Faults	Possible causes	Tests and Remedies
Unit with heater - heater does not work.	- Defective heater fuse?	Check for conductivity and if necessary exchange.
	- Defective heater?	Check heater and exchange defective heating elements, chapter 5.4.
	- Defective thermostat of dry-run protector?	Exchange, chapter 5.4.4.
	- Defective regulating thermostat?	Check and if necessary exchange, chapters 5.4.5 and 5.4.6.
Unsatisfactory cleaning results	- Unsuitable cleaning agent?	Use TICKOPUR, TICKOMED, STAMMOPUR, STAMMOSEPT or ask for advice.
	- Overloaded with items to be cleaned?	Reduce amount to be cleaned.
	- Fill-height of cleaning liquid in oscillating tank or inserted beaker too low?	Make sure it is 2/3rds full, goods to be cleaned must be completely covered with cleaning liquid.
	- Possible dirt layers on floor of oscillating tank or inserted beaker resp. many particles in the cleaning liquid?	Empty oscillating tank or inserted beaker, remove dirt, renew cleaning liquid (see also operating instructions "Cleaning/ caring of unit").
	- Defective oscillating system?	If necessary replace oscillating system, see chapter 5.5 or return unit for repair to the supplier.
	- Strong erosion	see following
Surface of oscillating tank matt or erosion marks on the surface	- Use of aggressive cleaning liquids (e.g. acids, cleaning liquids containing chloride ions)?	If the tank becomes leaky, it must be exchanged. ⇒ Return unit for repair to the supplier.
	- removal of aggressive dirt (e.g. salt residues) or abrasive dirt (e.g. polishing paste)?	
	- Cavitation erosion? After long operation periods, the cavitation attacks the stainless steel surface of the oscillation tank.	
	- Pitting corrosion? Is caused by rust particles from the water system, but also by metal particles which have remained in the oscillating tank or aggressive cleaning liquids.	

3 Repair advices

Repairs must only be carried out by authorised personnel!

- Replace defective parts with SONOREX original parts only.
- It is recommended to limit the repair of the units to the exchange of fuses, transistors, generator PCB with base plate, the heater, transducers (without new bonding), as well as the timer.
The parts mentioned are supplied as replacement parts.
- Information about electric components, connectors, cables, fuses can be found in the unit specific enclosures.
- In the case of measurements and adjustments, the oscillating systems must be connected with the generator. Use an extension cable for this and take care that the blue lead is well insulated → high frequency voltage of $\sim U_{\text{eff}} = 500 \text{ V}_{\text{rms}}$.
In some devices the red transducer line is connected to protective ground and/or with the tank.

4 Disassembly of unit



Before opening the unit, pull the mains plug!

- Place the unit upside down.
- **Carefully** remove the base plate
 - for units RK 31/H, RK 52/H/CH, RK 100/H/SH, TK 100/H, RK 102H/CH, RK 103H/CH, RK 156/BH, RK 158S, RK 170/H, RK 255H/CH, RK 510/H, RK 512H/CH, RK 513, RK 514/H/BH, RK 515 CH, RK 517H, RK 1028/H/BH/C/CH, RK 1029/H, RK 1040, RK 1050/BH/CH **remove screws from the base plate along the rim of the housing only.**
 - RK 106 unscrew 3 screws. Either **the screws in the feet or the screws from the base plate along the rim of the housing.**
Note:
Do not loosen the tank from the housing.
In case of defective tank or loosen adhering (of the oscillating systems) return unit for repair to the supplier.
- Electrical plug connections between the base plate with generator PCB and case with oscillating tank must be separated if necessary in accordance with the wiring diagram in appendix 3:
 - Remove the connectors from the timer (2 yellow and 1 brown + 1 blue wire in a silicon hose).
 - Remove both plugs for the heating (red wires), if necessary desolder power supply wire.
 - Remove both plugs for the HF wires to the oscillating elements (one blue and one red wire in a silicon hose).
- Exchange of fuses:
 - The fuses are located on the generator.
 - Check fuses and replace only defective ones.
 - Spare fuses are on the base plate.

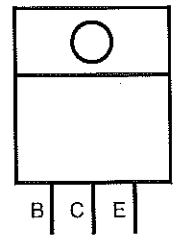
5 Repairs

5.1 Check of transistors

Check the transistors before exchanging, in order to save unnecessary costs.
The transistors can be checked in the inserted condition:

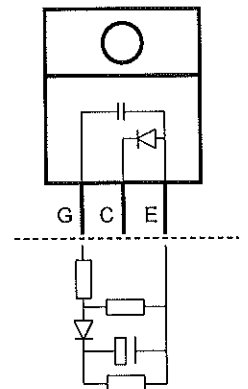
Check of the bipolar transistors (generators without ICs):

- 1) Diode behaviour of the paths B-E, B-C and E-C: in forward direction approx. 300 ... 500 mV voltage drop. In reverse direction no check is possible due to the circuitry outside the transistor.
In some generators the inverse diode (E-C) is situated at the board and can not be checked at the desoldered transistor.



Check of IGBTs (generators with ICs):

- 1) Diode behaviour of the path E-C: in forward direction approx. 300 ... 500 mV voltage drop.
- 2) The path G-E is "high impedance", but to parallel circuitry it takes some seconds to obtain a voltage > 1 V.
The voltage drop indicated depends on the instrument and is different for the two IGBTs due to different circuitry.

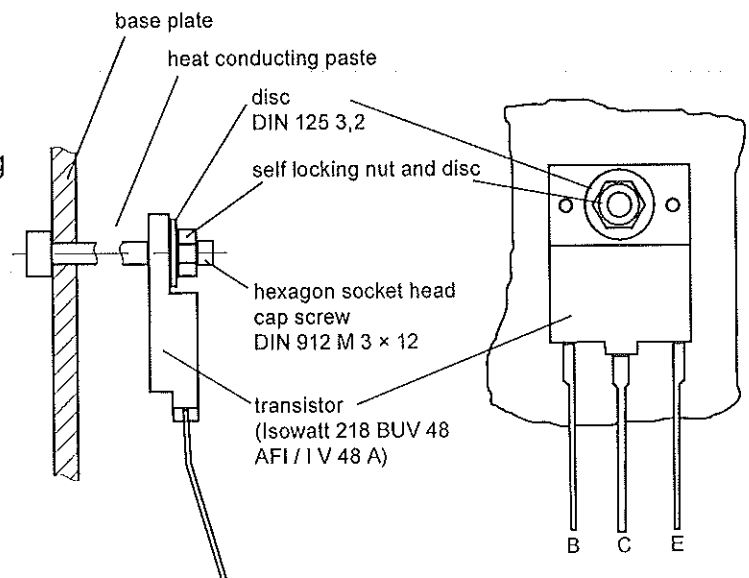


5.2 Exchange of transistors

5.2.1 Transistors in insulated case (Isowatt 218)

The transistors (for example BUV 48 AFI/IV48A (Isowatt 218)) are mounted on the base plate. They can be exchanged as follows:

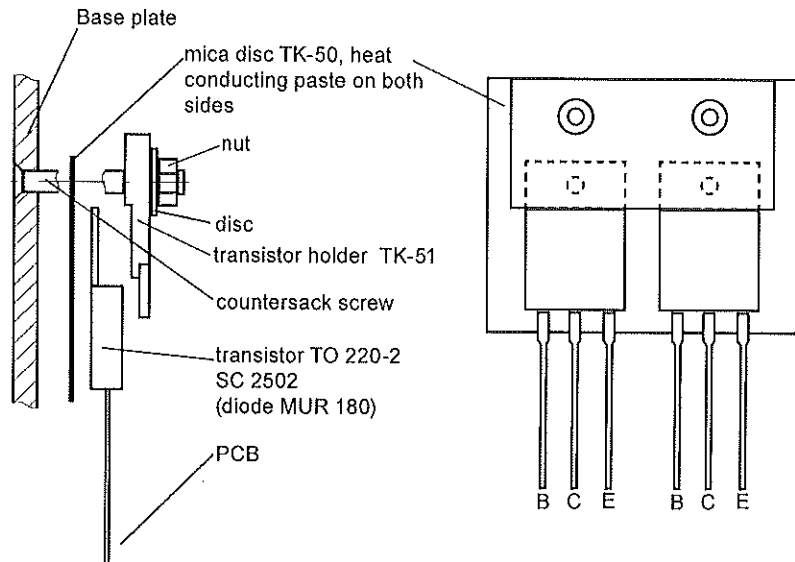
- Loosen the self locking nut M3 on the transistor.
- Cut off the transistor connections just below the transistor using side cutting pliers.
- The transistor is attached to the base plate by means of heat conducting paste, remove defective transistor using a knife blade or similar.
- Desolder the transistor connections.
- Tighten the new transistor with self locking nut.
- Solder the connections to PCB.



5.2.2 Transistors with plastic case (TO-220) and synthetic material press-on plate

Exchange the transistor as follows:

- Loosen the self locking nuts and the countersunk screws M 3 and remove the transistor holder.
- Cut off the transistor connections just below the transistor using side cutting pliers.
- The transistors are attached to the mica disc with heat conducting paste. Remove the transistor carefully using a knife blade or similar.
- Desolder the transistor connections.
- Assemble the transistor with the transistor holder, then solder it back on.
- Re-adjustment is not necessary, if possible the power input should be measured after the transistor has been exchanged; if it deviates from the nominal value by more than 20 % (see type plate), the power output must be adjusted again (see chapter 5.3.1).

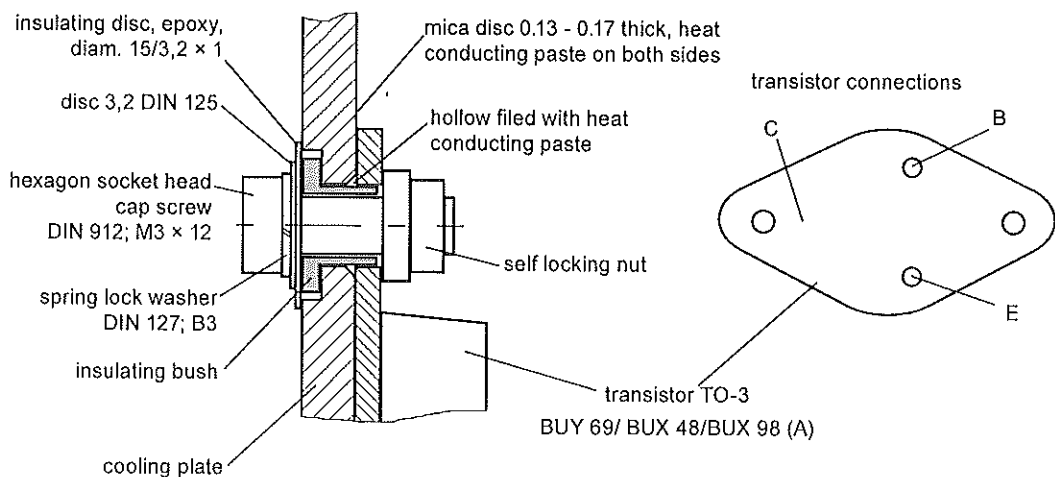


5.2.3 Transistors in metal case (TO-3)

Use matched pairs only.

Exchange the transistor as follows:

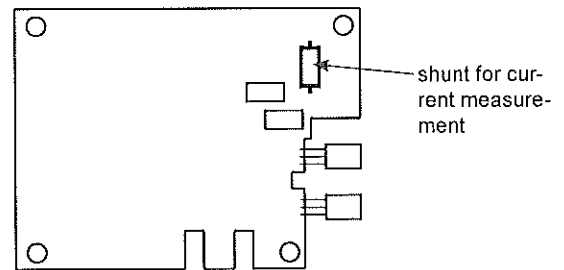
- Unsolder all connecting leads from one transistor.
- Loosen self locking nut and hexagon socket screw M3 from the transistor.
- Transistors adhere due to the heat conducting paste on mica disc. Remove the transistor carefully using a knife blade or similar.
- The transistors must be assembled very carefully with heat conducting paste, mica disc and insulating bushes so that the transistors are cooled well and no flashovers occur.
- Solder the connecting leads back on using the second transistor which still has the original wiring attached, as a pattern.
- Exchange the second transistor.



5.2.4 Transistor in plastic case and metal clip(s)

Before changing the transistors verify the shunt of the current measurement.

The value (imprinted) should be between 0,5 and 10 Ω . If this resistor has blown, further damages are probable and the equipment must be returned to the supplier for repair.



The exchange is to be made as follows:

- Unscrew the head screws M 3 and remove the fixing clip(s). (Caution: when removing the screw the cooling plate is unfixed as well. It only sticks by the thermal compound.)
- Cut the transistor legs underneath the transistor with a side cutter.
- Remove the transistor with the insulating tube.
- Unsolder transistor connections.

Attention:

No strength must be applied when pulling out the transistor legs. Prefer desoldering using a vacuum-pump instead of pulling the pin. If there are too much remnants of soldering tin or flux, than they have to be removed separately. If necessary disassemble the generator (not unplugging the wired connections). Remove the four screws from the board. Turn the board upside-down lifting the side with the transformer, HF-terminals and transistors over the opposite side (containing the mains fuse and the current shunt). Care for the cooling plate, which must not be moved.

Note for the assembly: The 4 short screws are intended to fixate the plate, the longer screw is for the fixing clip.

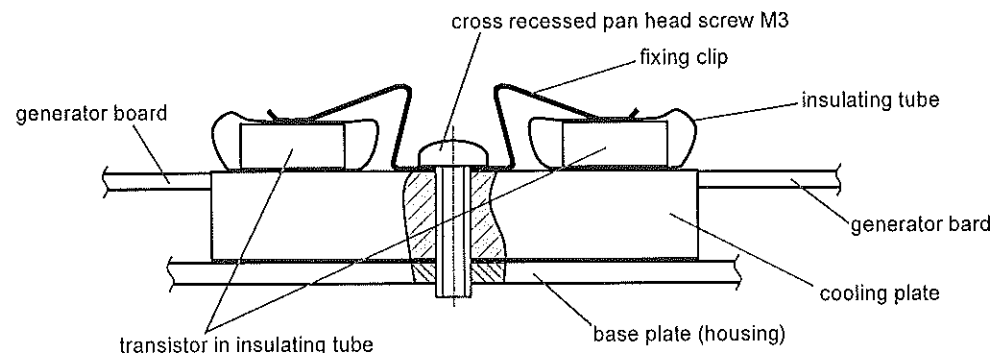
Tighten the screws by hand!

- Examine, whether the cooling plate was shifted, possibly adjust (it must not overlap with the board) and assemble the transistors with the fixing clip. Therefore, plug in transistors into holes. The transistor legs should look trough the hole by about 1 mm. Do not cut the legs, but adjust them. Bend the transistors until they fit on the cooling plate (slight spring back is allowed). Next step is soldering the transistor connections.
- Slide the standard insulating tube over the new transistor until it stuck on the board, but not between board and transistor connections.

Attention:

Handle cautiously – already small rifts or holes at the bottom side of the tube will cause malfunction.

- No recalibration of power or frequency is required.

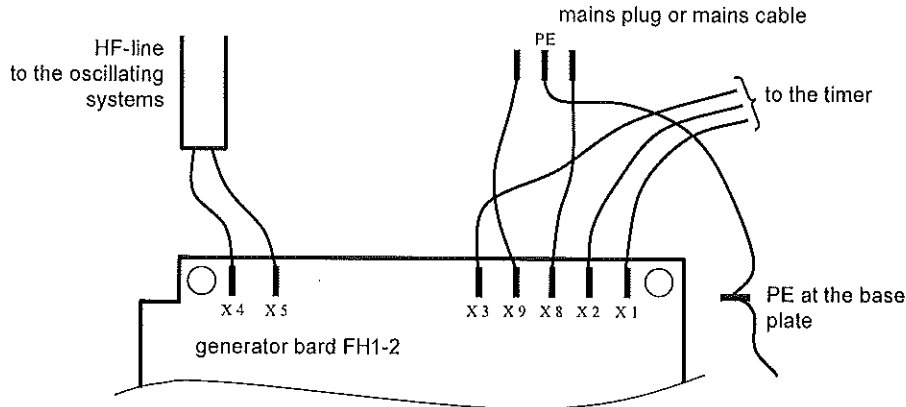


5.3 Exchanging the generator PCB including the base plate

Return ultrasonic cleaners RK 1028 C and RK 1050 /CH for repair to the supplier. The following repair instructions are not applicable for this type of units.

Note:

With exchange of a generator of actual conditions the wiring is to be made like before, see also the following sketch.



5.3.1 With original generator of older type and supply of a replacement generator without ICs

The generator PCB with base plate is preadjusted. The complete unit can be exchanged directly. However, deviations of the actual power input from the nominal power input stated on the type label cannot be excluded. If there is a greater deviation, the generator has to be readjusted.

Adjustment of generator



You are working with very high voltages!

You will need:

- watt meter, corresponding to the power consumption
- variable isolating transformer up to 250 V, corresponding to the power consumption
- circuit diagram, see appendix 1
- wiring diagram, see appendix 3
- adjustment instructions, appendix 4
- oscilloscope up to 20 MHz, modular oscilloscope probe 1:100, current probe

The generator is usually adjusted as follows:

- Disassemble the base plate with the generator PCB completely and place it next to the tank.
- Connect the transducers under the dry tank with the generator by means of a voltage-stable two-pole adapter cable.
- Replace the timer by wiring bridges.
- Turn the variable isolating transformer to zero! Connect the generator to the regulating transformer using a two-pole mains cable.

- Fill the tank 2/3 with lukewarm water. Add a splash of detergent.
- Adjust the regulating transformer slowly to approx. 150 V (115 V units: 75 V). At this value the generator should start to oscillate. If not, switch the regulating transformer off and on again at 150 V (115 V units: 75 V).
- Watch the reading on the watt meter. Slowly turn the regulating transformer to 230 V (115 V units: 115 V).

If the power input deviates by more than $\pm 20\%$ from the nominal value it can be set by carefully adjusting the core in the swinging choke, see layout (appendix 2). Once the correct value has been set, the adjusted core must be fixed with silicon rubber.

- Disconnect the unit from the transformer and re-assemble.

5.3.2 With original generator of older type (G) and supply of a replacement generator (FH1-2) with ICs

New generators FH1-2 are recognized clearly by the transistors with fixing clip and the ICs on the board, see also chapter 5.2.4.

The supplied generator with base plate can compensate the equipments tolerances by its regulation.

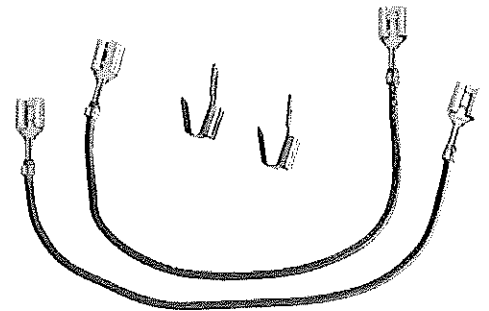
The complete unit can be exchanged directly without a new adjustment.

Replacement parts:

1 FH1-2 generator with base plate

1 mounting kit, consisting of:

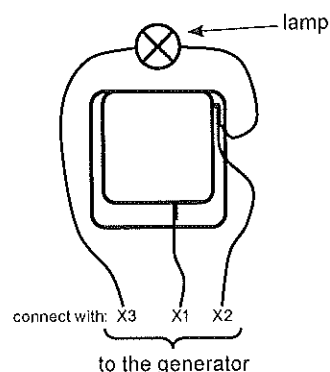
- 2 pieces cable with flat pin bushing (to be used with soldered mains entry)
- 2 pieces flat pin splitter (V 002)(to be used with units with heating)



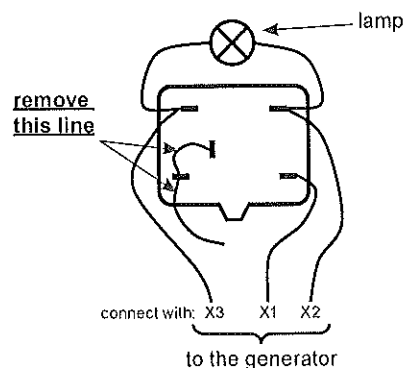
If the new generator has to be assembled with an older equipment, connect it as follows:

- In case of change of wiring at timer

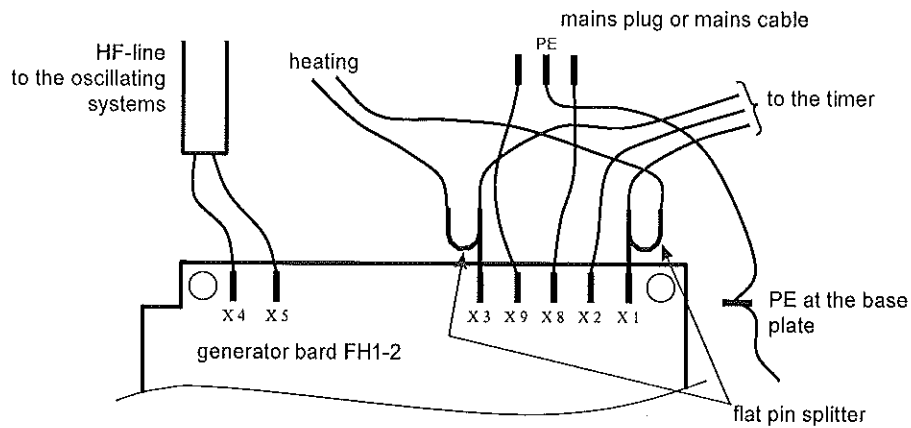
1-pole timer (N)



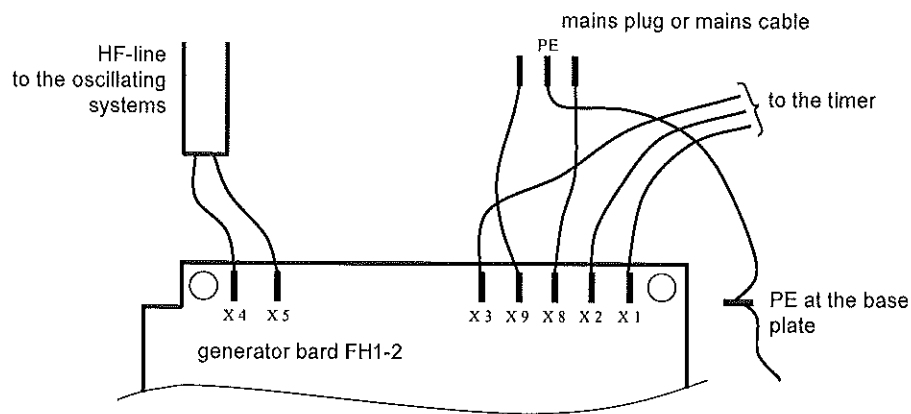
2-pole timer (L)



- Wiring of FH1-2 for older equipment with heating



- Wiring of FH1-2 for older equipment without heating



Attention: Take care of effective protective earth (PE) connections!

The generator board does not have a PE connection (gn/ye). It must be guaranteed that the following components are connected by PE braids: tank, housing and generator base plate.

If there is a remaining PE-wire, plug it on a free PE plug (e.g. free plug on the housing bottom) or remove it by a side cutter.

Potentially existing mains plug with EMC filters have to be replaced by normal mains plugs.

5.4 Repairing the heating

5.4.1 Checking the heating elements and data

- Check the heater fuses for conductivity in accordance with wiring diagram in appendix 3.
- Check the dry-run protector for conductivity.
- Check the heating for conductivity.
- Check the heating for faulty insulation against tank.
- Check the heater resistance.

Depending on the unit, the heater must have the following resistance values:

Type	230 V			115 V		
	W	Ω	%	W	Ω	%
RK 31 H	70	756	+/- 10	70	189	+/- 10
RK 52 H, RK 100 H, RK 100 SH, RK 102 H, RK 102 CH	140	378	+/- 10	140	94,5	+/- 10
RK 52 CH, TK 100 H	100	529	+/- 10	70	189	+/- 10
RK 103 H, RK 103 CH	200	265	+/- 10	200	66,25	+/- 10
RK 156 BH	600	88	+/- 10	600	22	+/- 10
RK 170 H	1600	33	+/- 10	-	-	-
RK 255 H, RK 255 CH	280	189	+/- 10	280	47,25	+/- 10
RK 510 H	400	132	+/- 10	400	33	+/- 10
RK 512 H	400	132	+/- 10	400	33	+/- 10
RK 512 CH	560	94,5	+/- 10	560	23,5	+/- 10
RK 514 H, RK 514 BH	600	88	+/- 10	600	22	+/- 10
RK 515 CH	700	75,5	+/- 10	700	19	+/- 10
RK 517 H	600	88	+/- 10	-	-	-
RK 1028 H, RK 1028 BH, RK 1028 CH, RK 1029 H	1300	41	+/- 10	1300	10,25	+/- 10
RK 1028 CH (from SN.: 143-00014564-001)	1450	36	+/- 10	1450	9	+/- 10
RK 1050 H, RK 1050 BH, RK 1050 CH	1950	27	+/- 10	1950	6,75	+/- 10

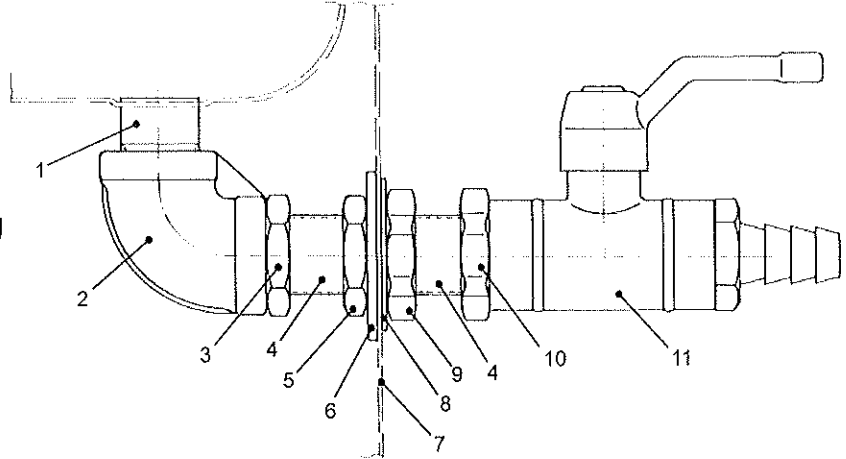
If an element is defective, the oscillating tank must be separated from the housing in order to repair the heater!

5.4.2 Separating the oscillating tank from the housing

5.4.2.1 Disassembly of screwed drain

- Remove the base plate, see chapter 4.
- Disassemble the drain: Cut the silicon rubber seal between the edge of the tank and the housing with a sharp knife and push out the tank.
- Pull the thermostatic sensor out of the push-in link or remove the regulating thermostat completely, see chapter 5.4.6.

Before disassembling, heat the locking nuts 3, 10, ball valve 11, nuts 5, 9 and 10 as well as the bended pipe 2 with a hot air pistol.



Then:

- Remove locking nut 10 from ball valve 11.
- Remove ball valve 11.
- Loosen nut 9 and fix with lock nut 10.
- Loosen nut 5 and screw it in the direction to the bended pipe 2.
- Loosen locking nut 3 from bended pipe 2.
- Unscrew the threaded pipe 4 using spanners for locking nuts 9 and 10 then, place spanner on locking nut 9.
- Remove nuts 3 and 5 so that the threaded pipe can be removed.
- Unscrew the heated bended pipe 2 with a pipe wrench from the screw neck on the tank 1.

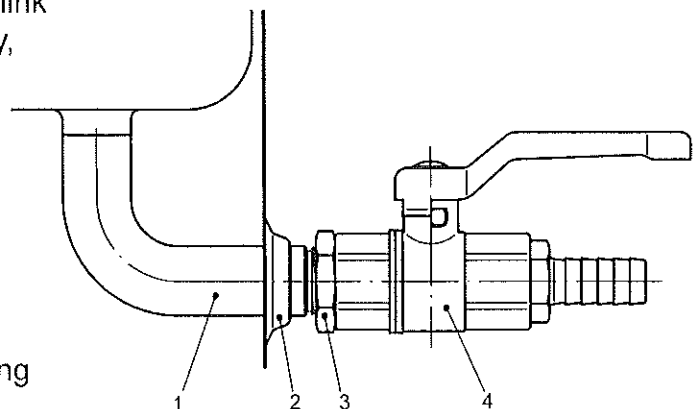
The assembly of the drain is described in 5.4.7.

5.4.2.2 Disassembly of welded drain

- Remove the base plate, see chapter 4.
- Disassemble the drain: Cut the silicon rubber seal with a sharp knife between the edge of the tank and the housing and push out the tank.
- Pull the thermostatic sensor out of the push-in link or remove the regulating thermostat completely, see 5.4.6.

Then:

- Unscrew the ball valve 4 and hold the locking nut 3 with a spanner.
- Unscrew the locking nut 3
- Take out the tank together with drain (2 = sealing ring).



The case rivets at the drain side must be drilled out and be replaced later when removing the tank from following cleaners:

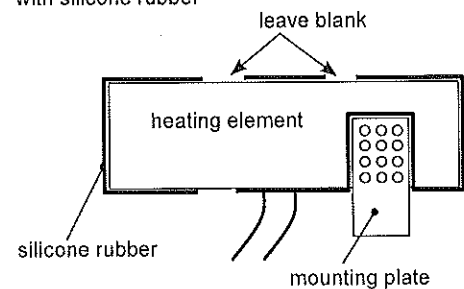
RK 158 S, RK 170 /H, RK 510 /H, RK 512 H /CH, RK 513, RK 514 /H /BH, RK 515 CH, RK 517 H, RK 1028 /H /BH /CH, RK 1029 /H, RK 1040, RK 1050 /BH /CH.

The assembly of the drain is described in 5.4.7.

5.4.3 Exchanging a defective heating

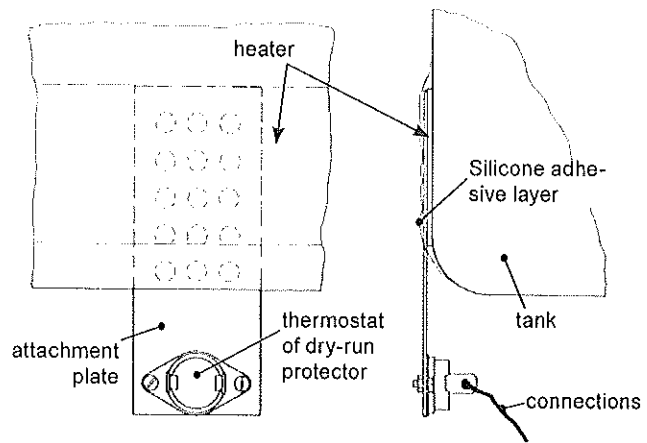
- Separate the connections of the defective heater and if necessary from the dry-run protector thermostat or the flat plugs on the PCB.
- Remove defective heating element(s). It may be necessary to remove the perforated attachment plate for the dry-run protector thermostat.
- Remove remains of adhesive and silicone rubber with a knife, spatula or similar, or with petroleum ether or diluent.
- Degrease and prime the mounting surface of the tank.
- Arrange the heating element(s) according to the wiring plan in appendix 3. The heating elements should be placed on the flat sides as close to the tank bottom as possible.
- Remove the protective foil from the heating element(s). Stick the heating elements to the tank and avoid trapping air bubbles.
- Press and roll the heating element(s) firmly onto the tank.
- If necessary stick the perforated mounting plate (dry-run protector thermostat) onto the heater with one-component cyanacrylate adhesive SICOMET.
- In order to protect parts from becoming loose, apply silicon rubber E 41 on the edges of the heating elements (5 mm layer) and on the perforated mounting plate (completely cover the bonded section of the plate). Do not completely paste the edges of the heating elements, but leave 1 cm blank on the long sides to avoid gas formation.
- Allow the adhesive layers to cure for approx. 12 hours.

Example: Sticking one heating element with silicone rubber



5.4.4 Exchanging the thermostat of dry-run protector

- Desolder or pull off connections.
- Unscrew the defective thermostat of the dry-run protector.
- Screw the new thermostat of the dry-run protector onto the attachment plate.
- Solder connections back on.

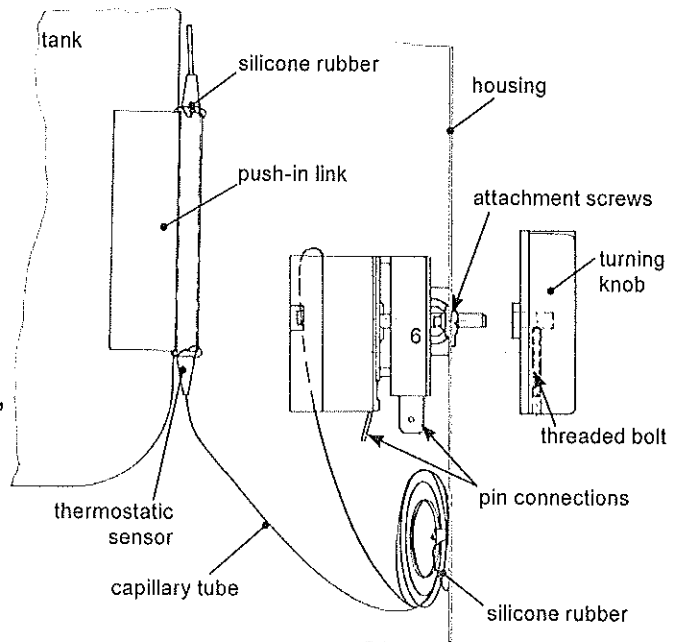


5.4.5 Checking the regulating thermostat

- Remove knob. Older units are equipped with turning knobs incl. threaded bolt. Loosen it before exchanging.
- Unscrew both attachment screws and tilt thermostat towards inside.
- Remove the plugged connections, do not bend the capillary tube!
- Put the regulator knob back onto the axis and turn it clockwise to switch it on. There should be conductivity between P 5 and 5 as well as P 6 and 6.
- Keep turning the knob clockwise until you can hear a "click", at this point there should be conductivity between 1 and 2.

5.4.6 Exchanging the regulating thermostat

- Remove knob. Older units are equipped with turning knobs incl. threaded bolt. Loosen it before exchanging.
- Unscrew the attachment screws from the regulator thermostat.
- Mark the pin connections of the thermostat in accordance with the pin number and then disconnect.
- Remove the thermostatic sensor from the tank. In order to do this, carefully remove the silicone rubber from the aluminium push-in link of the thermostatic sensor using a knife and tweezers, pull the sensor out of the push-in link with flat pliers turning slightly while doing so. The capillary tube connects the thermostatic sensor with the thermostat, remove the capillary tube carefully from the case, do not bend it under any circumstances.
- The assembly is carried out in reverse order. Fix the thermostatic sensor with silicone rubber E 41. Attach the capillary tube to the housing using silicone rubber E 41 in such a manner that it does not come into contact with live parts or the transducers.
- Connect the pins again in the right order.



IMPORTANT: Do not damage the thermostatic sensor or the capillary tube.

5.4.7 Assembly of oscillating tank and housing

- Fill the cleaned tank edge with compound "Terostat 931 - self levelling" (even and horizontal plate).
- Put the housing onto the tank.
- Allow compound to cure for 24 hours.
- Stick the thermostatic sensor of the regulating thermostat back into place using silicone rubber or insert the regulating thermostat.
- Assemble the drain again (chapter 5.4.2).

Screwed drain

At the factory all threads are sealed with liquid thread seals DELO ML No.119 (blue). The nuts are to be secured with screw securing liquid (blue) DELO ML No.121. The threads are pre-cleaned using spray cleanser DELOthen NK 1. Curing time is decreased by pre-treating the threads with the activator DELOquick 32. If the sealing agents are not available during assembly, you can also use PTFE tape.

- Screw the bended pipe 2 onto the screw neck 1 on the tank.
- Put the washer 8 and the niro nuts 9 and 10 onto the threaded pipe 4. Lock the nuts.
- Push the threaded pipe 4 through the housing 7, put the washer 6 on, screw on the nuts 3 and 5.
- Screw the threaded pipe 4 into the bended pipe 2, fix it with the nuts 9 and 10.
- Lock the nut 3 against the bended pipe 2.
- Lock the nuts 5 and 9 against the housing 7.
- Screw on the ball valve.
- Lock the nut 10 against the ball valve.

Welded drain

- Screw on the locking nut 3.
- Wind the white PTFE tape clockwise around the screw neck (approx. 10 turns).
- Screw the ball valve 4 onto the screw neck approx. 5 turns.

Attention:

Hold the screw neck with the spanner and locking nut 3, to take stress off the tank. Do not over-tighten the ball valve, do not unscrew it, the sealing will be damaged.

- Lock the ball valve with the nut 3 in an upright position.
- Connect generator and heating in accordance to the wiring diagram (appendix 3).

5.4.8 Replacement parts for the heating

Type	Heating elements					Thermostat of dry-run protector	Sili- cone E 41	Terostat 931	
	35 W	100 W	140 W	200 W	325 W	in °C	Tube	Tube	Car- dige
<i>RK 31 H</i>	2					60	1	1	
<i>RK 52 H / 100 H / 100 SH / 102 H</i>			1			118	1	1	
<i>RK 52 CH</i>		1				118	1	1	
<i>TK 100 H</i>		1				80	1	1	
<i>RK 102 CH / 103 CH</i>		2				118	1	1	
<i>RK 103 H</i>				1		118	1	1	
<i>RK 156 BH</i>				3		118	1		1
<i>RK 170 H</i>				8		118	1		1
<i>RK 255 H / 255 CH</i>			2			118	1		1
<i>RK 510 H</i>				2		118	1		1
<i>RK 512 H</i>				2		118	1		1
<i>RK 512 CH</i>			4			118	1		1
<i>RK 514 H / 514 BH</i>				3		118	1		1
<i>RK 515 CH</i>			5			118	1		1
<i>RK 517 H</i>				3		118	1		1
<i>RK 1028 H / 1029 H</i>					4	118	1		1
<i>RK 1028 BH / 1028 CH</i>					4	118	1		1
<i>RK 1028 CH</i> <i>(FROM SN.: 143-00014564-001)</i>				4	2	118	1		1
<i>RK 1050 H</i>					6	118	1		1
<i>RK 1050 BH / 1050 CH</i>					6	118	1		1

printed italic = also available for 115 V

5.5 Repair of oscillating systems

Return ultrasonic cleaners TK 100 and TK 100 H for repair to the supplier. The following repair instructions are not applicable for flat oscillating systems.

The oscillating systems are located under the bottom of the tank. Depending on the type of unit, oscillating systems with one or two PZT-rings are used (PZT \Rightarrow piezoelectric ceramic \Rightarrow lead-zirconate-titanate).

In the following cases the oscillating systems must be replaced:

- PZT-ring destroyed, tear (possibly visible).
- electrical flashovers on the transducer or on the interior insulating bushes (not visible).

However, if the adhesive has become detached (this can be determined by knocking on the tank's bottom from inside), the unit must be returned to the supplier for repair.

For the repair of oscillating systems you need torque spanner with hexagon pin 8 mm, spanner SW 7 and pin spanner with 3,8 mm pins (e.g. Belzer No. 4307).

5.5.1 Disassembly of defective oscillating systems

- Before disassembling the oscillating system remove transducer wires from the generator plate and plug them together (short circuit) otherwise you can get an electric shock. Remove transducer wires.
- Hold the steel bush with pin spanner, remove hexagon socket screw.
- Remove all parts.

Attention:

Cu-Be discs to be disposed as special waste.

5.5.2 Assembly of oscillating systems

- All parts must be replaced (see replacement parts).
- Ensure highest degree of cleanliness during assembly.
- Clean parts in suitable cleaning agents e.g. white spirit, acetone or thinner and dry them.
- Check evenness of cone with a straight-edge, the supporting surface must be clean and show no signs of scoring. If the surface is damaged or not even, the unit has to be returned to the supplier.

Order of assembly

Before mounting the steel bush and the hexagon socket head screw, DIN 912, M 10 × 40 it must be ensured that all parts are centred on the insulating bush (pay special attention to the Cu-Be discs).

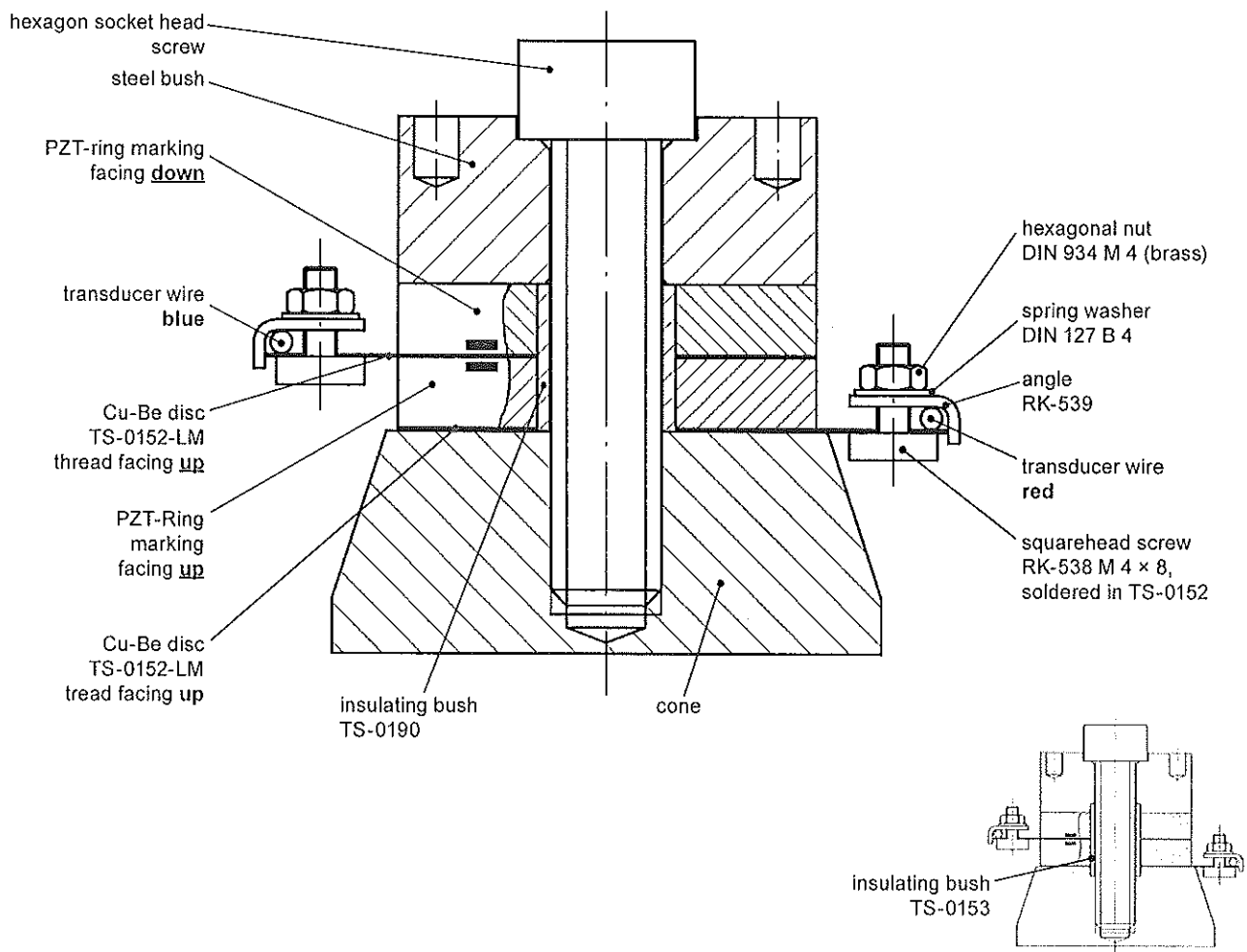
- Short-circuit the transducer wire (plug together)
- Hold the steel bush with the pin spanner and tighten the hexagon socket head screw, DIN 912, with a torque of 45 Nm (~ 4.5 kpm). (approx. 32,5 ft lbs.)
- Connect the blue silicone wire to the Cu-Be disc between the transducer rings, connect the red wire to the supported CuBe disc. Mount the transducer wire, angle, spring washer and nut and screw tighten them. Cover the connection with silicone.

When renewing the transducer wire, only use silicone wire!

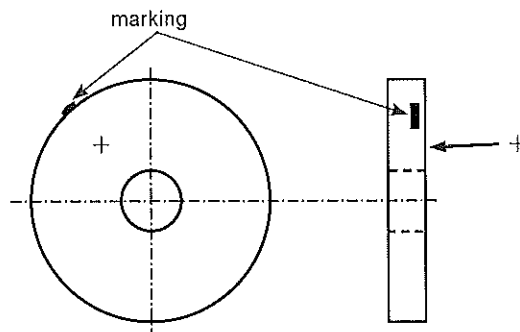
5.5.2.1 Oscillating systems with two PZT-rings

Replacement parts:

- 2 PZT-rings, diam. 38 mm, SW 004
- 2 Cu-Be disc with soldered squarehead screw, TS-0152-LM (Cu-Be = copper-beryllium)
- 2 angles, RK-539
- 2 spring washers, DIN 127 B 4, NU 101
- 2 nuts, DIN 934 M 4, NM 303
- 1 hexagon socket head screw, DIN 912-M 10 × 40, NS 343
- 2 insulating bushes, 1 × TS-0190; 1 × TS-0153 (to be used according to the existing oscillating system)



5.5.2.2 Marking of PZT-Rings



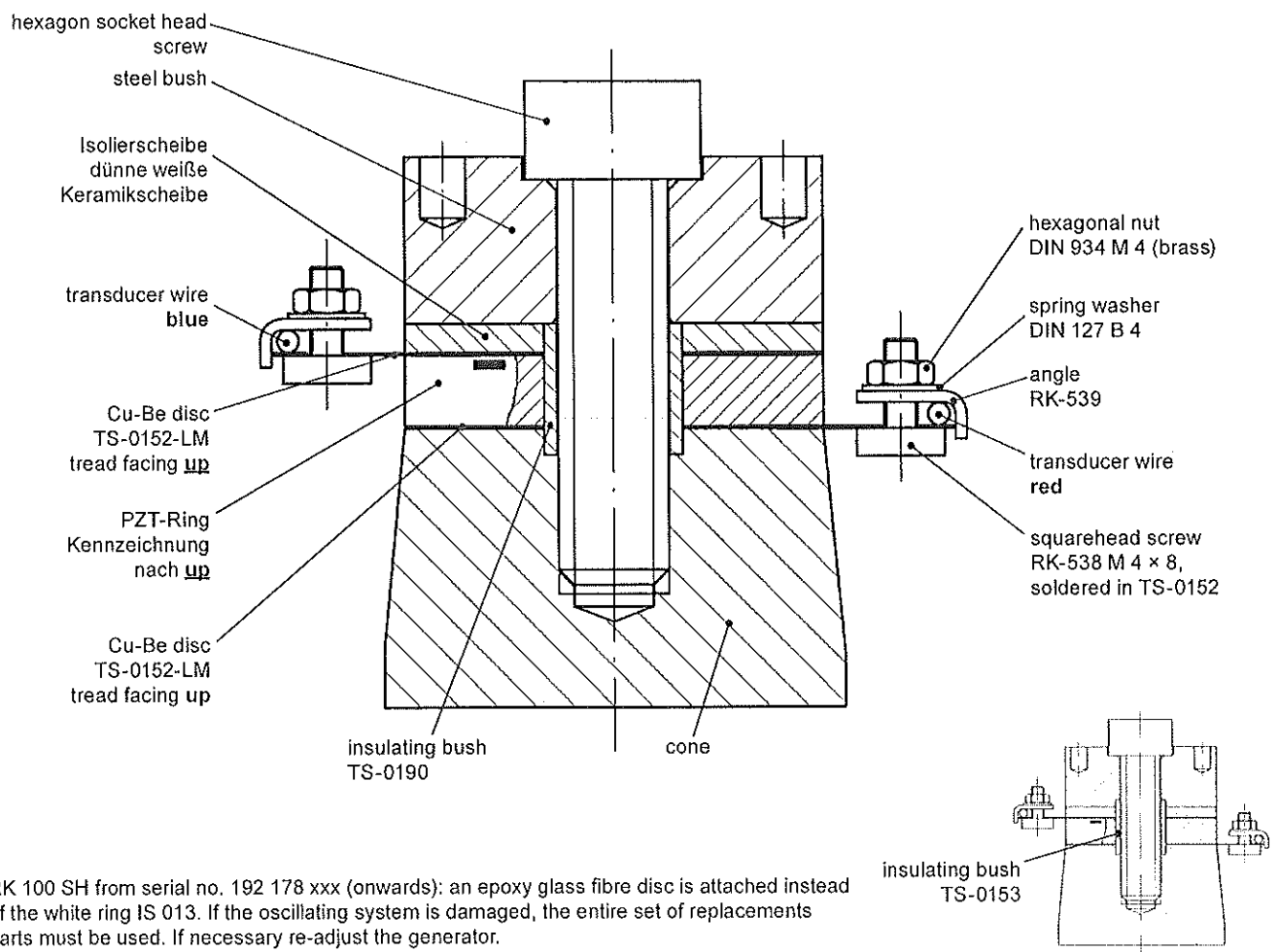
5.5.2.3 Oscillating systems with one PZT-ring

Replacement parts:

- 1 PZT-ring, diam. 38 mm, SW 004
- 1 insulating disc* IS 013 white ring
- 2 Cu-Be disc with soldered squarehead screw, TS-0152-LM (Cu-Be = copper-beryllium)
- 2 angles, RK-539
- 2 spring washers, DIN 127 B 4, NU 101
- 2 nuts, DIN 934 M 4, NM 303
- 2 insulating bushes, 1 × TS-0190; 1 × TS-0153 (to be used according to the existing oscillating system)

height in mm	hexagon socket head screw
17	NS 342 DIN 912-M 10 × 45
22	NS 347 DIN 912-M 10 × 50

- 1 hexagon socket head screw:

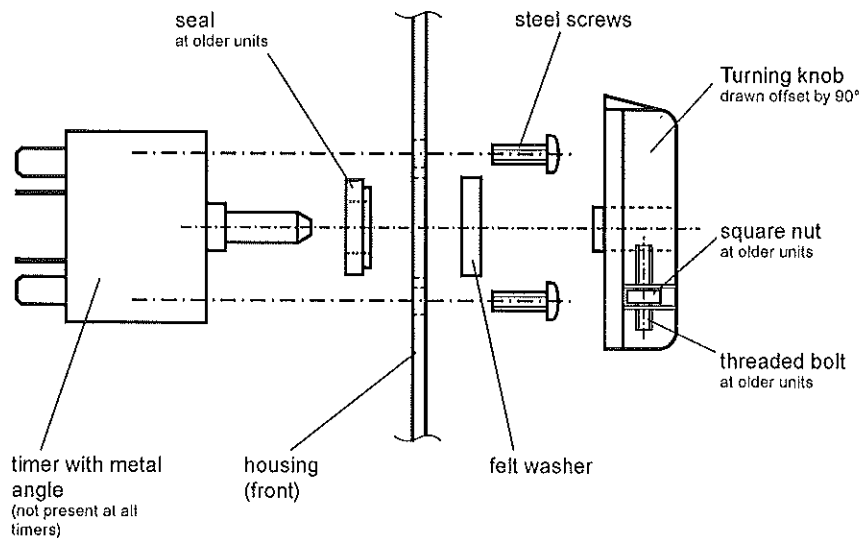


* RK 100 SH from serial no. 192 178 xxx (onwards): an epoxy glass fibre disc is attached instead of the white ring IS 013. If the oscillating system is damaged, the entire set of replacements parts must be used. If necessary re-adjust the generator.

5.6 Exchanging the timer

- Pull the mains plug!
- Remove the screws from the base plate (see chapter 4).
- Lift the base plate carefully.
- Remove knob. Older units are equipped with turning knobs incl. threaded bolt. Loosen it before exchanging.
- Pull off the plug connections from the timer.
- Loosen the steel screws from the housing and pull out the timer. Replace the seal if present, insert the new timer. Push the felt washer onto the axis.

Assembly in reverse order.



Notes:

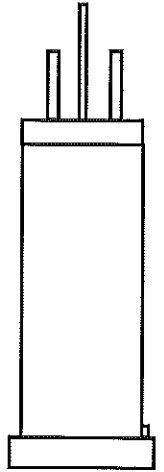
- The wiring diagram is a part of the mounting instruction delivered with the spare timer.
- The type of the timer Mi7-1 does not fit into old RK 31-housings with an over-all height of about 155 mm (new over-all height 170 mm). Therefore, the timer type N is necessary.

5.7 Exchanging the ventilator of RK 1050 BH

- Remove the base plate (see chapter 4).
- Mark both plug connections of the ventilator and pull them off.
- Loosen the four attaching screws / nuts from defective ventilator.
- Exchange the ventilator and assemble in reverse order.

5.8 Exchanging the pilot lamps

- Pull the mains plug!
- Remove the screws from the base plate along the case's rim and if necessary slotted head screws in the feet. Lift the base plate carefully.
- Pull out the defective lamp.
- Remove the clamping plugs with silicone hose from the contacts of the defective lamp.
- Clip the clamping plugs onto the contacts of the new lamp.
- Push the new lamp into the housing from outside.



Advices:

- Please observe the catch to the recess.
- Avoid contacting of wires and sharp edges (oscillating parts/isolation can be damaged)

6 Re-starting the unit

After repair, assemble the unit in reverse order as described in chapter 4.

IMPORTANT

- Make sure that all plug connections have been made correctly (for details see wiring plan in app. 3).
- Insert the base plate with the generator carefully.
- Fix all screws of the unit, fill it with cleaning liquid and switch it on.
- If the unit does not work, or if a fault occurs again after only a short period of time, you should return the unit to the supplier. It is important that you inform him in detail about the circumstances which lead to the failure, e.g.
 - cleaning liquid used
 - filling-level
 - parameters set - temperature, cleaning duration
 - details about the goods to be cleaned
 - operation time per day or similar

7 Data for current consumption

Type	230 V	115 V
RK 31	0,2 A	0,3 A
RK 31 H	0,5 A	0,9 A
RK 52	0,3 A	0,6 A
RK 52 H	0,9 A	1,8 A
RK 52 CH	0,7 A	1,4 A
RK 100	0,4 A	0,7 A
RK 100 H	1,0 A	2,0 A
RK 100 SH	1,0 A	2,0 A
RK 102 H	1,2 A	2,3 A
RK 102 CH	1,4 A	2,8 A
TK 100	0,4 A	-
TK 100 H	0,7 A	1,3 A
RK 103 H	1,5 A	3,0 A
RK 103 CH	1,6 A	3,2 A
RK 106	0,6 A	1,1 A
RK 156	0,6 A	1,1 A
RK 156 BH	3,4 A	6,8 A
RK 158 S	1,4 A	-
RK 170	1,4 A	-
RK 170 H	8,3 A	-
RK 255	0,7 A	-
RK 255 H	2,0 A	3,9 A
RK 255 CH	2,0 A	4,0 A

Type	230 V	115 V
RK 510	0,7 A	1,4 A
RK 510 H	2,5 A	4,9 A
RK 512 H	2,7 A	5,3 A
RK 512 CH	3,8 A	7,5 A
RK 513	1,4 A	2,7 A
RK 514	1,0 A	1,9 A
RK 514 H	3,6 A	7,1 A
RK 514 BH	3,6 A	7,1 A
RK 515 CH	4,4 A	8,8 A
RK 517 H	4,0 A	-
RK 1028	1,4 A	2,7 A
RK 1028 H	7,0 A	14,0 A
RK 1028 BH	7,0 A	14,0 A
RK 1028 C	2,2 A	4,4 A
RK 1028 CH	7,7 A	15,3 A
RK 1029	1,4 A	-
RK 1029 H	7,0 A	-
RK 1040	1,4 A	2,7 A
RK 1050	2,7 A	5,3 A
RK 1050 H	12,9 A	-
RK 1050 BH	11,1 A	-
RK 1050 CH	11,1 A	19,4 A

Manufacturer:

BANDELIN

www.bandelin.com
info@bandelin.com

60 years of experience in ultrasound

Certification

EN ISO 9001 / 12.2000 • EN ISO 13485:2003 + AC:2007

Subject to technical alterations.

BANDELIN electronic GmbH & Co. KG

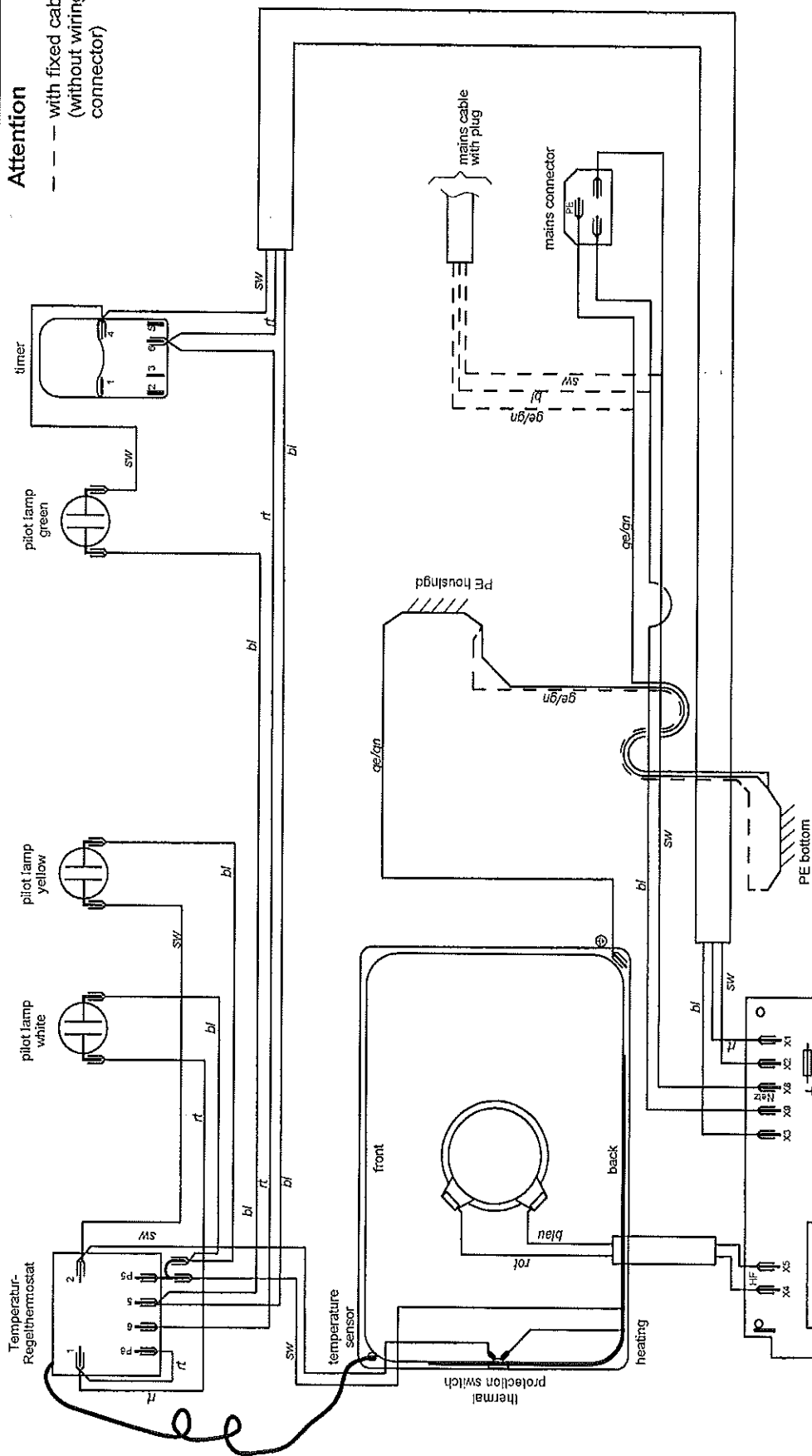
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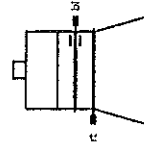
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Attention

--- with fixed cable
(without wiring to mains
connector)



cross-sectional
view



		Werkstoff		Werkzeug- Nr.		BANDELIN <i>electronic GmbH & Co. KG</i>	

Edition: 08.12.2006 / hn

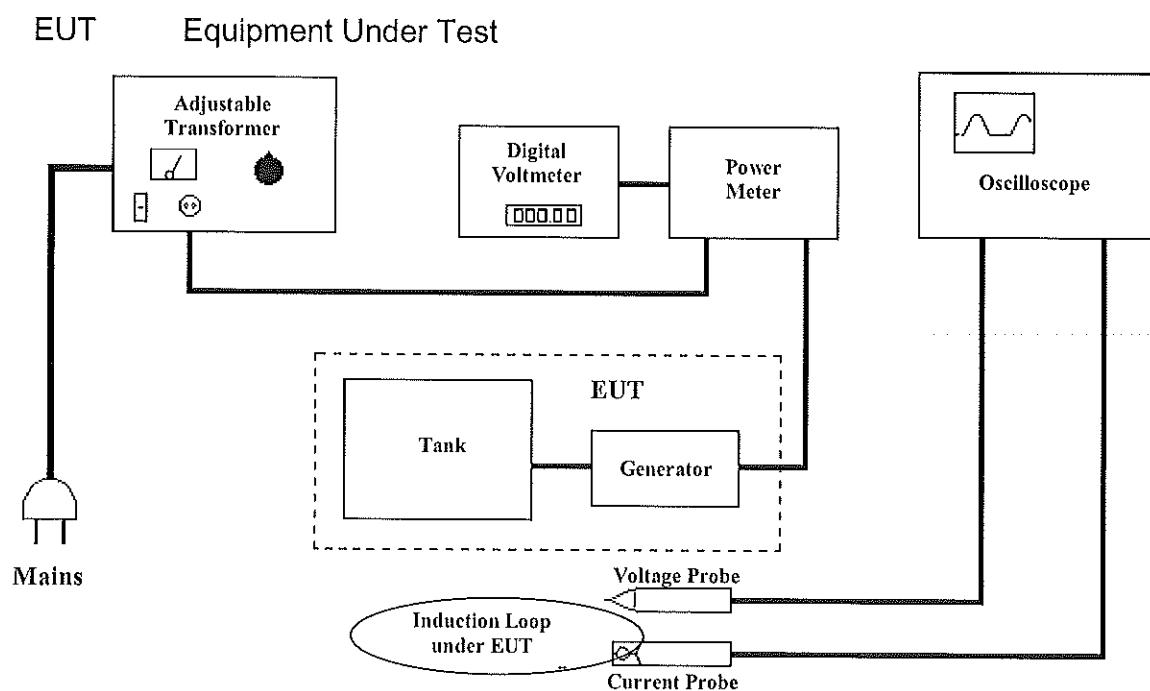
Pass:

Applicable with: **DT:** 31 /H, 52 /H, 100 /H /SH,
RK: 31 /H, 52 /H /CH, 100 /H /SH,
TK: 100 /H,
TG: 50, 100,
ZE: 100,
US1 (Retsch), Finosonic US 11;
 mit Generatoren der Serie -9 und FH1

1. Test Equipment

- 1.1 Adjustable isolation transformer (min. 5 A)
- 1.2 Power meter (e.g. Wattavi)
- 1.3 20-MHz-oscilloscope
- 1.4 Clip on current probe (e.g. Kenwood PC-80)
- 1.5 Digital voltmeter (DVM)
- 1.6 Equipment (e.g. Mini-Tester 0701-N or Metraster 5-3P) to test
 - Protection earth resistance
 - Insulation and
 - Leakage current
 (tests according to VDE 0701)

2. Test Environment



3. Test Procedure

3.1 Testing the Generator

Fill the tank of the ultrasonic unit with water (2/3 minimum liquid level) and add some mild detergent.

FH1-type generators have to be adjusted following the PV-10-18.

3.1.1 Adjust voltage at the transformer to 235V.

Connect probe to collector and emitter of the transistor T2
(Range: 100V, 5µs or use probe 1:100 resp.)

3.1.2 Check power consumption

Unit	Minimum [W]	Maximum [W]
DT 31 / H	25	32
DT 52 / H	55	65
DT 100 / H	70	80
DT 100 SH	70	80
RK 31 / H	25	32
RK 52 / H / CH	55	65
RK 100 / H	70	80
US 1 (Retsch)	70	80
US 11	70	80
RK 100 SH	70	80
TK 100 / H	65	75
TG 50	55	65
TG 100	70	80
ZE 100	70	80

3.1.3 Check frequency

Not required for FH1-type generators.

Unit	Minimum [kHz]	Maximum [kHz]
DT 31 / H	33	39
DT 52 / H	37	43
DT 100 / H	37	43
DT 100 SH	33	40
RK 31 / H	33	39
RK 52 / H / CH	37	43
RK 100 / H	37	43
US 1 (Retsch)	37	43
US 11	37	43
RK 100 SH	33	40
TK 100 / H	43	45
TG 50	37	43
TG 100	37	43
ZE 100	37	43

3.2 Functional Tests

Connect the unit to the supply voltage via a power meter (fault current breaker is required).

Check without water (dry testing), max. 5 s per test:

1. Ultrasonic function
2. Heating (if equipped with)

Verify the power consumption.

3.3 High Voltage Check

Check the correct PE-connection, the insulation and the leakage current.

3.4 Final Check

Following checks are required:

3.4.1 Timer function or key input

3.4.2 Heating regulator or key input

3.4.3 Pilot lamps or LEDs

3.4.4 Visual check of the housing.

3.4.5 Emission of ultrasound

3.4.6 Power consumption

